Welcome to the Computing Department

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Subject Overview

Key Stage 3: Years 7 and 8

Computer Science has become an important element in the world of work. Chenderit school prepares students for the 21st Century. The emphasis is on getting students to be the developers, to understand how computers work and think. As a result, in the KS3 lessons students are taught the basics of what a computer system is and how it works, learning to think like computers and use problem solving to help design. There will be a media element, introducing students to Photoshop image and animation design. We will be looking at a whole range of programming languages, which will build on students work on Scratch programming in Primary school. All students will learn at least two programming languages. We will be working with Python and BBC Mico:BIT along with the BBC BiteSize programme. Emphasis is on having fun in developing games and software.

Key Stage 4: Years 9, 10 and 11

Computing, programming and development is one of the key growth sectors in the UK economy. We live in an information society, one where the computer and the microchip are the development tools of the future. Some people argue that we do not yet produce enough computer scientists in the world and that people are only learning to use the tools, not to learn to make the tools themselves so that they can produce the next generation of software. Computer Science provides students with the skills they need.

This is a rigorous, knowledge-based, and intellectually-challenging GCSE, which teaches programming and the underlying principles of logic, decomposition, algorithms, data representation and communication.

Teaching Aims and Objectives

The overall aims within the computing department are for students to:

- understand and apply the fundamental principles and concepts of computer science, including abstraction, logic, algorithms and data representation;
- analyse problems in computational terms, and have repeated practical experience of writing computer programs in order to solve such problems;
- evaluate and apply information technology, including new or unfamiliar technologies, analytically to solve problems;
- think creatively, innovatively, analytically, logically and critically
- understand the components that make up digital systems, and how they communicate with one another and with other systems be inspired by the opportunities available within the world of computer science;
- understand the impacts of digital technology to the individual and to wider society apply mathematical skills relevant to Computer Science.;

- Spiritual aims
    - Spiritual education in computing provides opportunities for reflection of awe and wonder about what can be achieved through the appropriate application of computing technology today and the possibilities for the future. Computing enables pupils to reflect on how peripheral devices can be used to provide access for all and change people's lives for the better. To promote students' spiritual development, their sense of self and their will to achieve, the computing department strives to take the opportunity to praise students for their contribution in lessons and the progress they are making to achieve or exceed their targets as well as their perseverance and independence.

- Moral aims
    - Moral education in computing helps pupils to explore aspects of real and imaginary situations and enables them to reflect on the possible consequences of different actions and situations. It can raise issues such as whether it is morally right to have computer games where the aim is killing and violence, and whether it is fair that some people in this country and in other countries cannot use the internet. Through real life case studies, students also consider issues surrounding the misuse and access rights to personal data. Other moral issues surrounding the topics of e-waste and the digital divide are also explored through case studies. The use of case studies in computing encourages students to draw conclusions through evidence rather than their preconceptions whilst allowing the students the time to reflect on the origins of their own personal perceptions of a topic.

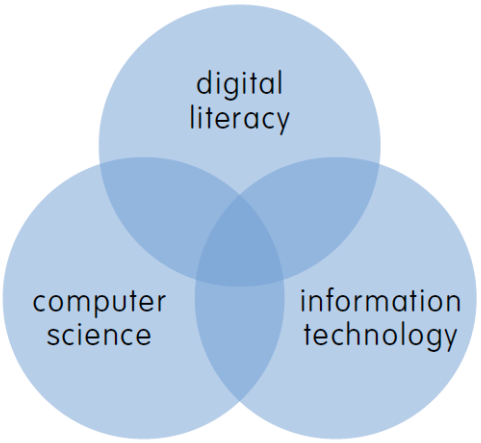
- Social aims
    - Social education in computing involves collaborative work which encourages students to become creative, reflective, effective participators who can work in a team and be self-managing. Computing can also help all students to express themselves creatively and clearly and make appropriate use of the hardware and software resources available to them. As students progress through their learning they will consider more complex social needs and they are encouraged to research issues that may affect particular groups within society and review the strategies currently being employed.

- Cultural aims
    - Cultural education in computing involves the breaking through of linguistic and cultural barriers. Students will be exposed to the technical discoveries from around the world, where they exist. Credit is given to the discoveries of other cultures. It is possible to e-mail or chat across the world and to word process in the mother tongue. Computing creates new opportunities to communicate such as social networks. Whilst studying various aspects of computing students are asked to reflect on how different cultures are portrayed on the internet and why or who is portraying them in this way. Students are also challenged to think about how differing cultures access and use the internet and what implications this has on the individual and the culture. The interdependence and sharing of knowledge by world cultures through the Internet is central to computing.

Course Information

Key Stage 3

Each term students will complete a module which has been designed to prepare students with the core knowledge needed to make progress towards the GCSE Computer Science course in Year 9. The modules have also been designed to cover key elements of the national curriculum and are designed with an awareness of the local community and experiences of our students.



Each module focuses on one of three strands, each of which complements each other and are essential in preparing students to thrive in an increasingly digital world. There will be a big question within each module that students will be expected to investigate. The knowledge, understanding and skills that students will develop during this investigation will cover a range of progression pathways which students will endeavour to achieve a mastery within. These pathways are:

- Algorithms
- Programming and Development
- Data and Data Representation
- Hardware and Processing
- Communication and Networks

Underpinning all of this curriculum design are the 'Big Ideas', the key computational thinking concepts that will enable students to make rapid and sustained progress with their understanding and development of programming skills:

- Algorithmic thinking
- Evaluation
- Decomposition
- Abstraction
- Generalisation

All of these concepts will be used together by students during the systems design life cycle of their computing projects.

Year 7:

Module 1 - Investigate the methods in which data can be stored within school and at home and how we can use Virtual Learning Environments to inform our learning. Be able to describe and identify elements of a computer system

Module 2 – To understand and be able to work in binary (think like a computer).

Module 3 – Developing computational thinking with the use of decomposition, pattern recognition and abstraction in developing solutions. This will also include an element of Photoshop and Media design.

Module 4 – Online Safety. To use computer technology in a safe situation taking note of moral, social, cultural elements in using computer technology.

Year 8:

Module 1 – Investigate and be able to explain hardware and software within a computer system. Be able to explore ethical, social and moral implications of technology.

Module 2 – Use two or more programming languages, at least one of which is textual, to solve a variety of computational problems; create, re-use, revise and re-purpose digital artefacts for a given audience, with attention to trustworthiness, design and usability.

Module 3 – An opportunity to explore the Software Development Life cycle to design and create a game using one or more programming languages. Using planning and development techniques.

Module 4 –To develop and create apps for the community using AppInventor. Students will be able use a range of programming skills to develop programs within the Development system using Software Development Life cycle techniques.

Module 5 – Understand the components that make up digital systems, and how they communicate with one another and with other systems. Investigate the main components in a computer system to understand how a processor works, how technology has changed and investigate new systems such as mobile technology hardware and software.

Module 6 – Understand the impacts of digital technology to the individual and to wider society and examine the legislation that covers safety and adherence to accepted patterns of behavior.

Key Stage 4

Year 9 and Year 10: GCSE Computer Science

Unit 01: Computer systems

- This component will introduce students to the Central Processing Unit (CPU), computer memory and storage, wired and wireless networks, network topologies, system security and system software.
- Learners will become familiar with the impact of Computer Science in a global context through the study of the ethical, legal, cultural and environmental concerns associated with Computer Science.

Unit 02: Computational thinking, algorithms and Programming

- This component incorporates and builds on the knowledge and understanding gained in Component 01, encouraging students to apply this knowledge and understanding using computational thinking. Students will be introduced to algorithms and programming, learning about programming techniques, how to produce robust programs, computational logic, translators and facilities of computing languages and data representation. Learners will become familiar with computing related mathematics.

Unit 03: Programming Project

- An assessment task will be made available at the start of the terminal academic year of assessment by the exam board.
- The task will provide opportunities for the students to demonstrate their practical ability in the skills covered in units 1 and 2.
- Students will need to create suitable algorithms which will provide a solution to the problems identified in the task. They will then code their solutions in a suitable programming language.
    - The solutions must be tested at each stage to ensure they solve the stated problem and learners must use a suitable test plan with appropriate test data.
    - The code must be suitably annotated to describe the process.
    - Test results should be annotated to show how these relate to the code, the test plan and the original problem.
    - Students will need to provide an evaluation of their solution based on the test evidence.
    - Students should be encouraged to be innovative and creative in how they approach solving the tasks.

Year 11: GCSE Computing

J276/01: Computer Systems and Programming.

- This topic introduces computer systems and provides a foundation for the remaining topics in this unit.
- Students develop a mental model of a computer system which comprises hardware and software and in which:
    - data is input and converted into the computer's internal representation by input devices,
    - the data is processed,

- the results of the processing are converted from the computer's internal representation and output by an output device. The data may be stored for later use or transmitted to another computer system, while it is still in the computer's internal representation.

Unit J276/02: Practical Investigation.

- This unit is designed to provide students with an opportunity to carry out a practical investigation into a computing issue and engage them with computing in the real world.
- The unit deliberately extends the student's work beyond the topics in Unit A451 in order to provide a stimulating experience.
- Students study one from a range of topics which will be supplied by OCR.
- Students are expected to carry out practical investigations of the topic and any supplementary research necessary to complete these investigations. They produce a report in which the topic is analysed, justified and evaluated showing evidence of the practical work undertaken.

Unit J276/03: NEA

- The examination board issues a range of assessment tasks, each consisting of up to three sub tasks. The set of tasks within the controlled assessment provide opportunities for the students to demonstrate practical ability and to use the skills outlined in the specification for this unit.
- Students need to create suitable algorithms which provide a solution to the stated problem then code their solutions in a suitable programming language. The solutions must be tested at each stage to ensure they solve the stated problem using a suitable test plan with appropriate test data. The code must be suitably annotated to describe the process. Test results should be annotated to show how these relate to the code, the test plan and the original problem. Students need to provide an evaluation of their solution based on the test evidence.

Homework Expectations (Including ICT resources and websites)

Students in Years 7 and 8 are set homework every second week. This homework could be focused on the core lesson task and allow students to continue and make further progress. Sometimes the work set may be in preparation for the next lesson and might require students to access specific online help sources. Every effort is taken to support students who do not have home access to a computer or may need to use an alternative piece of software. Most homework will require students to be able to access the school's virtual learning environment (VLE) to access additional support materials and sometimes to submit their completed work and self-assessment. Where students are expected to access particular websites these will be provided on the VLE.

GCSE students are set homework to focus on extending the students' understanding of a topic through extension activities, wider questioning or research. There may be occasions when students are encouraged to use additional homework time to prepare for controlled assessment tasks.

Websites frequently used:

- Sam Learning
- Mind Mapping
- Computer Programming
- Programming tutorial
- Learn to code
- Logic
- Curriculum
- Teach ICT
- GCSE Computing
- Hour of code
- App Development
- Programming
- Game Design

Extra-Curricular Opportunities

Students have access to IT rooms before school and also during morning break and lunchtime. During this time students can continue with classwork or homework and they can also use the time to extend their software skills beyond the confines of the classwork. There are numerous opportunities for students to establish focus groups during this time and if required a member of staff can be available for additional support during Wednesday and Thursday lunchtimes in IT3. Currently there are two planned activities: the first is focused on the Python programming language and the second on the design of webpages. New clubs and groups can be set up and customised to the needs of a group of students.

Marking and Assessment

Key Stage 3

Students' work is marked regularly to acknowledge effort, skills, knowledge, understanding and the development of independent learning.

Marking takes three forms:

- Contact marking
- Peer and self-assessment
- Formative assessment

Contact marking is intended to check that all work has been completed with appropriate effort by the students. Computing teachers do not formally grade this work, but will offer encouragement and may point out spelling and grammatical errors or give directions on how to improve the presentation or content of the work. It is expected that this will take place during a module and that the student will then have the opportunity to make the improvements needed.

Peer and self-assessment is used to enable to students to reflect on the mark scheme and expectations and make their own determination about the standard of a piece of work. It is used to provide immediate feedback during lesson times and helps to ensure that students have a robust understanding of the assessment criteria and the work expectations.

Formative assessment is intended to give specific advice to each individual student. At key stage 3, this form of marking will usually form a key part of each project and will be used to give feedback to the student about the standard of their work and the depth of their understanding in relation to the computing progression pathway which students are following. In addition to the formal mark, students will also be given some advice on how their work could be improved as well as the marks being recorded on a personal record sheet.

At the beginning and end of each module students will have the opportunity to complete a formal assessment of their current level of knowledge, understanding and skills. At the beginning of the module is will be used to establish their current depth of understanding and to identify areas where additional support may be needed. At the end of the module this assessment will be used to establish the progress that a student has made.

Key Stage 4

At GCSE Level, course work and examination work are marked in a similar way. In the NEA tasks students are allowed to have general feedback about their work which points out aspects of their work that could be revisited but direct guidance cannot be given. Work is marked according to the Examination Board's marking criteria in all cases.

Examinations

GCSE

Years 9 and 10 and 11

Computer Science – J276 OCR

- Unit 01: Computer systems; 1 hour 30 minutes written paper (50%)
- Unit 02: Computational thinking, algorithms and programming; 1 hour 30 minutes written paper (50%)
- Unit 03: Programming Project; Exam board set scenario task. Not accessed at present.